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MEDICAL TRIUMPHS AND OPPORTUNITIES

BY W. GILMAN THOMPSON, M.D.

It has been customary in popular reviews of medical science to belittle the work of Americans and extol that of Germany as being the source of all medical "kultur." Nothing could be more erroneous. While it is true that pathology and bacteriology owe much to German scientists, and that the discovery of salvarsan, and of the tuberculosis, cholera, and diphtheria germs originated in Germany, that country, on the other hand, had nothing whatever to do with the discovery of ether and chloroform, of antisepsis (which belongs to France and England), of the germ of whooping cough (a discovery which belongs to France), of the cause of malaria (which belongs to Italy), of organo-therapy and vaccine-therapy (which belong primarily to England), or the modern treatment of beri-beri, dysentery, leprosy, and a number of other widespread diseases.

On the contrary, it is a source of great gratification and pride that the epoch-making medical discoveries contributed in the United States fully equal in importance, both individually and collectively, those of any other country, while the immediate practical application of many other discoveries has been far greater. In the former class may be mentioned the discovery of ether anaesthesia, the extinction of yellow fever, the cause of and cure for cerebro-spinal meningitis, with the whole matter of proper infant feeding. As illustrations of the latter group may be cited especially the strides made in the control of tuberculosis, diphtheria, malaria, hookworm disease and typhus fever.

It has been said that "American medicine built the Panama Canal," meaning that through the knowledge of the causes and prevention of yellow fever, dengue, dysentery, typhoid and malarial fevers, control was obtained over those diseases which had decimated the workmen employed by the French in their early attempt to complete that great undertaking. With equal truth it may be said that the outcome of the Spanish-American War came near being frustrated through lack of knowledge and application of the methods of disease prevention which have made such enormous strides within the past two decades.

In the Spanish War many more deaths resulted from disease than from casualties, and in fact these deaths began to occur before our ill-protected troops had left their own country. More than one-fifth of all the soldiers in encampments acquired typhoid fever, and 1,580 deaths were recorded among 20,000 cases of this perfectly preventable infection. Some of the men acquired simultaneously the three diseases —typhoid fever, malaria, and dysentery. Similarly, in the British South African War there were over a thousand more deaths from typhoid fever than from the wounds of battle. What a contrast is presented by the health of our troops in Mexico and along the Texan border during the past year! The average sick rate was not only less than at home, but the men have returned with improved physique.

Betterment in camp hygiene began to yield striking results in the Russo-Japanese War, and the lack of any considerable number of cases of typhoid fever on the western battle front in the present war is due not only to improved hygienic measures, but to the employment of preventive inoculations against typhoid fever.

This noteworthy progress in medical science is due to the knowledge and development of the theory of the germ origin of disease, which as an hypothesis, at least, is by no means as new as is generally supposed, for it was suggested as a possible explanation of the plague by the learned Jesuit priest Father Kircher, born in 1601. It cannot, however, be said to have made much progress until the middle of the latter half of the past century, when the controversy which centered about the experiments of Pasteur with bacterial fermentation and the practical work of Lord Lister in antisepsis, finally led to the discovery by Koch of the bacillus of tuberculosis in 1882 and of that of cholera in 1884. Since that date, almost each year has placed one or more of the acute febrile disorders in the list of those in which the causative germ has been demonstrated.

As the discovery of antisepsis rapidly increased the boldness of surgical procedure, the variety of serious operations which could be performed with safety provoked the criticism that medicine, in distinction from surgery, was much less progressive. This criticism has become no longer justifiable, for medical progress within the past two or three decades has developed to an extent which, in the saving of lives, has far surpassed all previous collective medical achievement. This is due to the further evolution of the germ theory; for the mere identification of the germ causing a particular disease, while interesting as a discovery, would not alone lead to the conservation of life. The evolution may be summarized as follows: First, the identification of each kind of germ. Second, the knowledge of its life history both within and without the body. Third, the study of the particular antiseptics, disinfectants, or other means for its destruction. Fourth, the discovery of the mode of transmission of the germ—as to whether it be through direct contact or whether it be air borne (like the germs of cholera and typhoid fever), insect borne (like malaria and yellow fever), or vermin borne (like typhus fever, bubonic plague and trench jaundice)—and, as a corollary, the fact that several infections are transmissible through more than one of these agencies. Fifth, the discovery of the existence of infection "carriers," by which is meant the possibility that persons who have suffered at some time from typhoid fever or cholera, for example, may harbor the germs which no longer affect them, and thus perhaps years later may transmit them to others. Sixth, the establishment of protective immunity in the individual, which implies the increase of his resisting power against the inroads of disease. Apart from the maintenance of the general health, this is accomplished by the injection into the body of such substances as vaccines, serums, antitoxins, etc. These procedures are too technical for present discussion, but they are based either upon the cultivation of the germs in appropriate media in the laboratory, or by inoculating an animal with them and subsequently using its blood serum (in which certain changes have taken place) for inoculation into man. After cultivation in the laboratory, either the dead germs themselves may be used for inoculation, or substances which they have developed are employed, each variety of germ having distinctive modes of growth and reactions.

It is popularly supposed that this treatment is designed to kill germs in the system; but, on the contrary, the action is to increase the " antibodies," or stimulate other changes in the body, thereby counteracting the toxines produced by germs and otherwise reinforcing the natural protective agencies which tend to prevent the body from succumbing to infections.

It is researches of this order which have produced so great an advancement in the applications of medical science within the past few years as to make it quite impossible to compute the total number of lives saved or the economic gain achieved through reduction of protracted illness.

A single example may be cited in the behavior of yellow fever epidemics. Formerly the Atlantic and Gulf Coast cities were frequently ravaged by epidemics of this infection, which in earliest times reached as far as Philadelphia and Boston and later extended up the Mississippi River to Memphis. Sometimes as many as fifty per cent of the population were attacked during a single epidemic, and the mortality was often exceedingly high, reaching fifty per cent of those attacked among the white population of New Orleans in 1878. In Cuba the disease prevailed one hundred and thirty years. In 1881 Dr. Charles J. Finlay of Havana, a native of Philadelphia, suggested the mosquito as the probable carrier of the disease, but nearly twenty years elapsed before a commission of medical officers of the United States Army, headed by Dr. Walter Reed, established the contention beyond a doubt. The result was the practical extermination of the disease from Havana by General Gorgas in 1901, and subsequently from the Panama Canal Zone, while no serious epidemic has developed in the United States for many years. All this forms a striking illustration of the influence of one discovery upon another, for the specific germ of yellow fever has not yet been determined, although the mode of transmission and consequently of prevention of the disease is absolutely established, and the previous study of the mosquito transmission of malaria had much to do with elucidating similar problems. The value to the world of discoveries like these surpasses estimation.

By no means all of the recent progress in medical science concerns the infections of germ origin. Conspicuous among other accomplishments may be noted the advancement in knowledge of certain parasitic diseases, especially the hookworm disease; a better understanding of dietetic diseases such as the oriental beri-beri, scurvy, pellagra and diabetes; the discovery of the diseases of the so-called " ductless glands," particularly of the thyroid gland; the study of diseases of the stomach and other abdominal organs, made possible through the agency of the X-ray (with other means of diagnosis), and researches in the disorders of the heart through the complicated and delicate apparatus known as the " electrocardiograph," by means of which not only the action of the heart as a whole, but of its separate chambers, may be made graphic and interpreted with precision. With regard to that most dreaded disease, cancer, while an enormous amount of experimental research has been conducted, means of prevention and of specific treatment have yet to be determined upon a generally accepted basis, although the effects obtained through the use of radium have yielded brilliant results with some of the superficial varieties of the affection.

One of the most interesting of all medical discoveries is that of the hookworm disease, which has been so prevalent in the Southern United States, the Pacific Islands, and many other regions. This disease is characterized by marked anemia, digestive disorders, malnutrition, perverted appetite, and remarkable apathy with a " cadaveric stare." Children affected by it remain stunted in growth and become degenerate. In some localities, such as Porto Rico and the Seychelles Islands, upwards of ninety per cent of the entire native population have been infested by the parasite. In the Southern States the disease was long known as " cotton mill anemia," and Dr. Stiles has estimated that prior to the institution of the simple curative treatment with thymol, over 2,000,000 cases existed in the United States. The Rockefeller International Health Commission, after instituting the control of the disease in the Southern States, has conducted a health survey of Oriental countries through Dr. Victor G. Heiser, with the purpose of aiding its universal extermination. From the widespread distribution of the malady, its grave character and the millions of its victims, the recent discovery of its mode of prevention and cure may well rank as one of the greatest triumphs of modern medicine.

With regard to the diseases of dietetic origin, they may be said to be, in great part, negative rather than positive—that is, they are due more to the absence of certain foods from the dietary than to any one particularly injurious food. The most striking illustrations are the dietetic cure of scurvy by fresh fruit or vegetable juices, notably the cure of scurvy in infants by fresh orange juice, and the cure of the tropical " beri-beri," a form of generalized neuritis accompanied by dropsy. This prevails among natives who live almost exclusively upon polished rice—that is, rice grains from which the outer layer, or pericarp, has been removed by milling. In the Philippines, Dr. Heiser practically eradicated the disease from among the native scouts by changing their diet, and the Surgeon-General of the Japanese Navy, Dr. Takaki, rid the service of the disease by the addition of bran and fresh fish to the ration.

Certain diseases are caused by alterations in the secretions of the so-called " ductless glands," which possess varied and important physiological action. One of these diseases which involves the thyroid gland, known as " myxedema," produces, among other symptoms, a profound degree of mental dullness, so great, in fact, that formerly the victims of it were sometimes placed in asylums under the mistaken diagnosis of melancholia. In children the disease produces dwarfs or cretins. It was found through animal experimentation conducted mainly by Sir Victor Horsley, and clinical experimentation by others, that feeding an extract of the gland would completely arrest the malady, and, in cases not too far advanced, promote a cure. Fortunately the disease is not very prevalent, but its control ranks among the most remarkable of medical victories, and the dime museum will have to search far for dwarfs in future! This method of employing extracts of animal glands and tissues for treatment is known as " organo-therapy."

Comparison is sometimes made between an engine and the mechanism of the human body. Maintenance of the highest efficiency in the machine depends upon the purity of its fuel, the removal of waste, protection from extraneous dirt, control of wear, avoidance of external injury, and the effect of " speeding up." Just so in the body, the maintenance of health depends upon the purity of food, the adequate removal of waste excretions, protection from foreign organisms, the control of fatigue and strain, and the injurious effect of what is technically known as " speeding up," or working long hours under the stress of hurry and concentration.

When an employer hires a human " machine " to operate a mechanical machine, he has a right to ascertain not only that the human organism is in good condition at the outset, but to require that it be maintained in a state of maximum efficiency. This he may do through physical examination of all employees before hiring them, and by providing periodic medical examinations to check up, so to speak, any deviations from health such as may be due to alcoholism, unsanitary modes of life, etc., and by giving advice or caution against continuance of such habits. It is mainly within the past dozen years that this sound economic principle has been appreciated in this country.

In addition to the annual toll of 25,000 lives lost through preventable industrial accidents in the United States, there is the morbidity rate among the industrial workers, which is estimated, in round numbers, at more than 13,000,000 cases of illness a year, with a consequent loss in wages of $366,000,000. Although by no means all of this illness is necessarily the outcome of conditions immediately connected with industry, a very large part is preventable, and might be controlled if organized labor were associated with organized medical supervision, such, for example, as obtains in the modern hygiene of a military encampment. The matter is of immediate interest in connection with the present war, and one of the sub-committees of the Council of National Defense is charged with the function of the medical direction of all those employed in the production and manufacture of war materials, in order not to repeat the grave errors committed by England at the commencement of the war, when so many munitions workers became incapacitated through the fatigue and strain of overwork and speeding up, combined with poor food, poor transportation, and poor housing. One of the greatest fields for medical endeavor in the future lies in this direction, for many of the lessons impressed by the exigencies of war preparation may be made of permanent application and great value.

But further comparison between the mechanical engine and human mechanism fails, because the living organism possesses the ability in marked degree to restrain of itself the inroads of wear and strain, and, through rest, to return to normal standards. There are, to be sure, other factors to be reckoned with, such, for example, as the influences of heredity; but although most of these elementary facts have long been recognized, it is only lately that their full significance has been appreciated, and many infectious diseases which a generation ago were accepted as unavoidable now come within the possibility of complete control. Thus the pure food problem is to a great extent covered by legislation, both federal and local, which regulates methods of food preparation, preservation, and transportation. Moreover, it is just beginning to be understood that through legislation many germ diseases may practically be exterminated, as in the case of compulsory vaccination of school children against smallpox, the intelligent application of quarantine regulations, the protection of water supply, etc.

Still more lately—in fact within the past decade—this country has awakened to the possibility of legislative control of what are termed industrial or, more broadly, "occupational diseases." These are not new diseases, in the sense of new pathological changes, but are distinctly caused by conditions of work, such as deleterious substances used in manufacture, unfavorable working environment, the use of harmful processes, the strain of too long hours of work and many other factors.

The occupational diseases number several hundred, and a few only of the more striking examples may be enumerated here. Workers in munitions are subject to a variety of serious and sometimes fatal maladies caused by such substances as dinitrobenzine and dinitrotoluol, picric and nitric acids. Workers in dyestuffs suffer from serious anilin poisoning, besides a great variety of other chemical injuries. Makers of felt hats acquire chronic mercury poisoning, which produces premature senility of both body and mind. Workers in brass foundries acquire a distinctive illness characterized by chills and digestive disorders, and there are one hundred and fifty different trades in which lead poisoning constitutes a common hazard. Particularly prone to this ailment are automobile painters, pottery glazers, makers of enamel bathtubs, typesetters, makers of storage batteries, lead smelters and house painters. The use of varnish containing wood alcohol has proved fatal in not a few instances, and in some cases blindness may result. Many of the dusty trades, such as grinding, polishing, and sand-blasting, give rise to serious disorders of the respiratory system. Electric arc-welding may produce permanent eye injuries and other lesions. Tunnel and caisson workers under compressed air are subject to the paralyzing and often fatal "caisson disease."

These few examples from among the hundreds which might be cited, serve to illustrate the important fact that whereas medical science has been actively engaged in reducing the mortality and morbidity from diseases of germ origin, a new order of diseases is arising and rapidly extending through the influence of modern economic conditions. Fortunately the latter are almost entirely preventable, and wherever they can be controlled through education rather than through legislation the results are certain to be more satisfactory and enduring. The manufacturer has already learned the enormous economic gain to be derived from protecting his employees from accidental injury. He is more slowly, but as surely, learning the advantages to be derived through industrial disease prevention. It is preferable to lead rather than to drive; nevertheless, where educational methods operate too slowly, resort may be had to legislative compulsion, and the workmen's compensation laws and workmen's insurance acts now existing or pending in several States are destined to eradicate many of the modern industrial disease hazards.

In forecasting the future of medical science there can be no question that the trend will be increasingly toward prevention, thus rendering cure uncalled for. A considerable number of the dread scourges of former generations are now known to be absolutely preventable, and theoretically, at least, capable of complete extermination. It is a question of education, plus the practice of commonsense rules of hygiene, and their enforcement where necessary, by legislation. In many of these directions the layman must join with the physician to obtain the best and most lasting results, particularly through insistence upon the maintenance of expert and competent local boards of health and the enactment and enforcement of sanitary laws. If, for example, a river contaminated with typhoid fever germs flows through an adjoining State which has no legislative control over the source of the menace, a serious epidemic may result, and this situation, with similar conditions, frequently has arisen in this country through lack of co-operation. Efforts to eradicate widespread hookworm disease, or the bubonic plague, have often met with the intense opposition of ignorance and superstition, despite the earnest efforts of physicians. Fortunately the Federal Government, so long inactive in such matters, is now, through its Bureau of Hygiene, in a position to deal promptly with many threatened epidemics, and to supplant inert or incompetent local authorities, as was done during an epidemic of plague in San Francisco a few years ago.

In summary, the future achievements of medical science are most likely to expand in certain definite directions as above outlined. While not belittling the improvements in the handling of the action of drugs or the " materia medica " of earlier days, which are constantly going on, these opportunities for development are:

1. Additions to the knowledge of the life history of many known disease germs and the discovery of new ones.
2. Prevention, based upon such knowledge, comprising insect and vermin destruction, water purification, etc.
3. Methods of immunization and treatment through organic agencies, such as vaccines, sera, and antitoxins.
4. Possible extension of the use of organic glandular extracts, known as " organo-therapy."
5. More frequent physical examinations to detect in their early stages such diseases as those of the heart, kidneys, and other vital organs, and to restrict their progress.
6. A better understanding of food values and of the so-called " disorders of metabolism."
7. Control of the industrial or occupational diseases.

Finally, the means through which this progress may be expected, comprise mainly:

1. The further elevation of the standards of medical education, now actively in progress.
2. The increasing number of those who are willing to devote all their energies to research in distinction from medical practice.
3. The co-operation of laymen by the endowment of institutions of medical research.
4. Raising of the standards of municipal and State health boards.
5. Unification of State activities in hygiene under national control.

W. Gilman Thompson.